Avian Interactions with Utility Structures

Contract #: 500-01-032
Contractor: Santa Cruz Predatory Bird Research Group (University of California at Santa Cruz)
Contract Amount: $3,000,484. (Year 1: $1,000,484; Year 2: $2,000,000)
Energy Commission Funding: $3,000,484
Match Funding: Year 1: PG&E/SCE $227,100; Avian Power Line Interaction Committee (APLIC) $28,000; EDM International $18,500
Contractor Project Manager: Brian Walton
Commission Contract Manager: Linda Spiegel

The Issue

California's electricity transmission and distribution (T&D) lines deliver the conveniences and comforts of electricity to more than 36 million citizens, and the state's wind turbines provide more than 1,800 megawatts (MW) of electricity. However, these electric utility structures present a potential collision and electrocution hazard to the state's birds.

Photo courtesy of EDM International, Inc.

With more than 600 resident and seasonal bird species in California, a certain amount of interaction between birds and utility structures is inevitable. About 40,000 miles of transmission lines[1] and 200,000 miles of distribution lines[2] crisscross the state, and thousands of wind turbines provide power in the Altamont, Tehachapi, and San Gorgonio wind resource areas.

Estimates of avian fatalities attributable to these structures vary considerably. Nationwide, it is estimated that tens of thousands to as many as 174 million birds are lost to fatal collisions with transmission lines alone.[3] In California, the figure is unknown, although it is plausible that such collisions result in the deaths of hundreds of thousands of birds each year.[4] Electrocutions on

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[1] Spiegel, Linda. 2004. *A Roadmap for PIER Research on Biological Issues of Siting and Managing Transmission Line Rights-of-Way.* Staff Paper. California Energy Commission. 500-04-031.

[2] Hunting, Kevin. 2002. *A Roadmap for PIER Research on Avian Power Line Electrocution in California.* California Energy Commission. P500-02-072F. December. p. 8.

[3] Erickson, W. P., et al. 2001. *Avian Collisions with Wind Turbines: A Summary of Existing Studies and Comparisons to Other Sources of Avian Collision Mortality in the United States.* Washington, D.C.: National Wind Coordinating Committee. p. 1. www.nationalwind.org/pubs/avian_collisions.pdf.

[4] Hunting, Kevin. 2002. *A Roadmap for PIER Research on Avian Collisions with Power Lines in California.* California Energy Commission. P500-02-071F. December. p. i.

distribution lines and collisions with wind turbines add several thousand more to that total. Although researchers have recorded and estimated individual bird mortality at various sites, the effect on bird populations is unknown.

In addition to the impact on birds, the social and financial costs of these interactions can be high. Electrocutions can cause power outages, which can create public safety and health hazards and potentially affect the California economy. Pacific Gas and Electric (PG&E) and Southern California Edison (SCE) have estimated that 25% and 10%, respectively, of all outages in their systems are caused by avian interactions.[5] Pacific Gas and Electric has noted that bird- and animal-caused outages are the third leading cause of all outages in their system.[6] A recent study concluded that the "base case" estimate of the cost of wildlife-caused power outages on the California economy is $34 million each year.[7]

In addition, some of the affected birds are on federal and state threatened or endangered species lists and are protected by federal and state law. Fines for the accidental "take" of these species from utility structure interactions can range from $250,000 per incident for individuals to $500,000 for companies.

The need for wind-powered electricity generation plants in California is more crucial now than ever. California's renewable portfolio standard, established by Senate Bill 1078,[8] requires the state's investor-owned utilities to produce 20% from renewable sources by 2017, and pressure is building to achieve the 20% goal by 2010. However, there is a moratorium for increased wind generation at the Altamont Pass Wind Resource Area until avian issues are resolved. The lost generation potential at that site alone impairs the state's ability to reach this goal.

Because avian collisions with utility structures threaten birds, electricity system reliability, and the state's economy, it is important to identify the causes for these interactions and develop measures to prevent them. For example, some studies have shown that 95% of electrocutions would be prevented by upgrading 2% of utility poles. Researchers also need to develop and test mitigation measures for different species of concern. For avian electrocution issues, research needs to examine the physical and behavioral features of affected bird species and physical factors such as weather, geography, pole design, and distribution system configuration.[9]

Project Description

The Public Interest Energy Research Environmental Area (PIER-EA) selected the Santa Cruz Predatory Bird Research Group (SCPBRG) at the University of California at Santa Cruz to manage projects that develop and test new methods and technologies to reduce avian interactions with utility structures. A technical advisory committee (consisting of agency, university, and industry members) is advising and directing the research and helping to ensure its applicability.

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[5] Pers. comm. 2001. M. Dedon (PG&E) and D. Pearson (SCE).

[6] PG&E 2001. Draft Proposal to the CEC PIER Program.

[7] Energy and Environmental Economics, Inc. 2005. *The Cost of Wildlife-Caused Power Outages to California's Economy.* California Energy Commission, PIER Energy-Related Environmental Research. CEC-500-2005-030.

[8] Senate Bill 1078 (SB 1078, Chapter 516, Statutes of 2002, Sher)

[9] California Energy Commission. 2002. *A Roadmap for PIER Research on Avian Power Line Electrocution in California.* P500-02-072F. December. p. i.

The goal of this work is to reduce avian fatalities and electrical outages caused by avian electrocution and collisions with utility structures. Research focuses on the development of tools, technologies, and protocols to evaluate, mitigate, and reduce avian interactions with these structures in California and to evaluate the effectiveness of those measures.

Initially, two PIEREA roadmaps provided direction for this work: *A Roadmap for PIER Research on Avian Collision with Power Lines in California,* and *A Roadmap for PIER Research on Avian Power Line Electrocution in California.* Those roadmaps identified four research categories for work in this area: risk assessment, risk reduction, compliance monitoring, and technology transfer.

In the first year of funding, the CEC PIER-EA/SCPBRG Avian Transmission systems Mitigation Program awarded six research projects, listed below:

- **Raptor Electrocution on Power Lines: Problem Assessment, Mitigation, and Monitoring,** with the U.S. Geological Survey
- **Revising and Updating *Suggested Practices for Raptor Protection on Powerlines: The State of the Art in 1996,*** with SCE and the Edison Electric Institute
- **Monitoring Raptor Facilities and Validating a Preliminary Model for Predicting Electrocution on SCE and PG&E Distribution Facilities,** with SCE and PG&E
- **Evaluating and Reducing Avian Collision at the Cosumnes River Preserve,** with Marcus L. Yee, California State University, Sacramento
- ***Raptor Mortality Field Guide,*** with EDM International, Inc.
- **Bird Electrocution Mitigation Web Site and Product Encyclopedia,** with EDM International, Inc.
- **Corona Testing—Devices to Mitigate Bird Collisions,** with EDM International, Inc.

The SCPBRG will conduct workshops and publish reports to disseminate the results of this work. Results of current projects were presented at the Raptor Research Foundation annual conference, November 2004, in Bakersfield, California. Results will also be presented at the Western Section of the Wildlife Society annual meeting in February 2006 in Sacramento, California.

A second year of funding has been provided to implement additional projects that address some remaining high-priority research identified in the roadmaps discussed above, as well as in a third: *A Roadmap for PIER Research on Avian Interactions with Wind Turbines in California.*

Projects that received second-year funding include:

- **The Trend of Golden Eagle Territory Occupancy in the Vicinity of the Altamont Pass Wind Resource Area: 2005 Survey,** with Grainger Hunt and Teresa Hunt
- **Cost-Effective System to Monitor Turbines for Bird and Bat Collisions—Phase I,** with EDM International, Inc.

- **Monitoring System for Studying Avian and Wildlife Interactions with Power and Communications Facilities,** with EDM International, Inc.

- **Repowering the Altamont Pass Wind Resource Area (APWRA): Forecasting and Minimizing Avian Mortality Without Significant Loss of Power Generation,** with Shawn Smallwood and Lawrence Livermore National Lab

PIER Program Objectives and Anticipated Benefits for California

This project offers numerous benefits and meets the following PIER program objectives:

- **Providing environmentally sound and safe electricity.** The standards, methods, and tools developed by this project will help reduce avian fatalities from interactions with utility structures. As a result, the impact on threatened and endangered bird populations will be reduced, and line and wind turbine owners will be able to comply better with the state and federal laws protecting most birds.

- **Providing reliable electricity.** Reducing the number of power outages caused by avian interactions with utility structures will improve the reliability of California's electricity delivery system. Identifying and addressing causes of wind turbine-related mortality may enable wind turbine facilities to increase capacity in the state.

- **Providing affordable energy services.** This work will improve the energy cost/value of California's electricity by enabling transmission systems to be retrofit with bird-friendly designs that reduce the costs associated with avian-caused power outages and by reducing avian mortality associated with wind turbines.

Results

Results of these projects will be listed on the project summary for each particular project.

Final Report

PIER-EA staff intend to post the final reports on the Energy Commission website in summer 2006 and will list the website links here. A report will be prepared for each individual project, as well as a summary report that that discusses the results for all of these projects.

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